

**REMARKS**

Claims 1-21 and 24-32 are pending in this application. Claims 22 and 23 are withdrawn pursuant to a species election requirement.

Claim 1 has been amended to indicate that the pressure is applied to said one or more fluid following application of light to an expandable element located adjacent to and upstream of the one or more fluid. Support for this feature is found in original claims 2 and 3, and on page 5, lines 13-14 of the specification. Claims 2 and 3 have been canceled. Claims 1, 39 and 40 have been amended to change the word “substance” to --reactant--. *See*, for example, page 3, lines 7-14 of the specification. No new matter has been added.

**Claim Rejections - 35 USC § 112**

Claims 28 and 29 have been amended as suggested by the Examiner.

**Claim Rejections - 35 USC § 102**

**The Examiner has rejected claims 1-3, 8-10, 24 and 27-30 as anticipated by Handique.** Applicant respectfully requests reconsideration of this rejection.

Handique describes a fluid microprocessor that is designed to release a measured microdroplet of fluid. The present application is concerned with the opening of a valve between two chambers, to allow mixing of fluids. Handique does not disclose a biochip as claimed, comprising a substrate defining a plurality of fluid holding areas, there being fluid separating means for preventing mixing of fluids held in said areas until the application of pressure to one or more said fluid, characterised in that the biochip comprises at least a first reactant in a first fluid holding area, said first reactant being in a substantially inactive or dormant condition, and a second reactant capable of activating the first reactant in a second fluid holding area, the first and second fluid holding areas being separated by said fluid separating means and the pressure is

applied to said one or more fluid following application of light to an expandable element located adjacent to and upstream of the one or more fluid.

As discussed in the specification at page 2, lines 14-20, this biochip can be used for fluid transfer without requiring any additional electrical connections or pumps. Neither these features nor the advantages associated with them are disclosed or suggested in the prior art. It is submitted therefore that claim 1 is both novel and inventive over Handique.

Regarding the rejection of claims 2 and 3, these claims have been deleted and therefore the objection is now moot.

Regarding the rejection of claims 8-10, these claims depend from claim 1 and are therefore patentable over Handique for the reasons set forth above. Further, it is submitted that the 'separation means' to which the Examiner refers is not a separation means at all. In fact, lines 13-22 of column 37 refer to figure 6A, which shows a microvalve which is used, according to Handique, for controlling the movement of droplets through the system (column 16, lines 59-67) but not for separating first and second reactants as recited in claim 1. Thus, the subject matter of dependent claims 8-10 is also novel over Handique.

Regarding the rejection of claim 24, this claim depends from claim 1 and is therefore patentable over Handique for the reasons set forth above. Further, Handique discloses a port which is comprised of a puncturable membrane and not a cover with perforations as set forth in claim 24. As described in the present application at page 13, the cover contains at least one perforation or opening so that displaced air can escape and gas transfer is facilitated. Neither this feature nor the resultant advantages are disclosed in Handique and therefore the subject matter of claim 24 is also novel over this prior art document.

Regarding the rejection of claims 27-30, these claims depend from claim 1 and are therefore patentable over Handique for the reasons set forth above.

**The Examiner has rejected claims 1-9, 12-16, 18-19, 24, 26-30 as lacking in novelty over Quake.** Applicant respectfully request reconsideration of this rejection.

Quake discloses a microfluidic device in which a separating means can be opened by increasing pressure in a channel. Claim 1 has been amended, as discussed above, to indicate that the pressure is applied to one or more fluids following application of light to an expandable element located adjacent to and upstream of the one or more fluid. Quake has a general disclosure (paragraph 147) of the use of the application of thermal energy for valve actuation, but does not specifically disclose a biochip or the use of thermal energy for valve actuation in a biochip as presently claimed, and therefore the invention recited in amended claim 1 is novel over the disclosure of Quake.

Regarding the rejection of claims 2 and 3, these claims have been canceled.

Regarding the rejection of claim 4, this claim depends from claim 1 and is therefore patentable over Quake for the reasons set forth above. Further, the Examiner stated that paragraph 147 of Quake discloses a heat-responsive expandable element, and that the fact that the expandable element is expandable on exposure to light does not further define the structure of the device. It is submitted that in fact, the claim does not recite applying light, but that *the expandable element is expandable upon application of light thereto at a suitable wavelength to cause heating of the example element*. Thus, claim 4 defines the material necessary to achieve the effect, in other words defines the properties of the expandable element. It is not possible to further define the structural features of this element without unnecessarily limiting the scope of

claim to which the inventor is entitled. Therefore, the subject matter of claim 4 is also novel over Quake.

Regarding the rejection of claim 5, this claim depends from claim 1 and is therefore patentable over Quake for the reasons set forth above. Further, it is submitted that the membrane described in paragraph 239 is not a separation means, but is a semi-permeable membrane for the purpose of dialysis and other similar functions. Quake does not disclose separating means for preventing mixing of fluids held in said areas until the application of pressure to one or more said fluid, the separating means being a frangible membrane or film. Therefore, the subject matter of claim 5 is also novel over Quake.

Regarding the rejection of claims 6-7, these claims depend from claim 1 and are therefore patentable over Quake for the reasons set forth above. Further, it is submitted that the membrane described in paragraphs 239 and 240 is not a separation means, but is instead a semi-permeable membrane for the purpose of dialysis and other similar functions. Quake does not disclose separating means for preventing mixing of fluids held in said areas until the application of pressure to one or more said fluid, the separating means being a frangible membrane or film made of a polymer. Therefore, the subject matter of claims 6 and 7 is also novel over Quake.

Regarding the rejection of claim 8 and claim 9, these claims depend from claim 1 and are therefore patentable over Quake for the reasons set forth above. Further, it is submitted that paragraphs 144 and 147 to which the Examiner refers describe the means for actuating valves. Although a fluid is mentioned on line 15 of paragraph 144 and on line 9 of paragraph 147, these are not describing separating means for preventing mixing of fluids held in said areas until the application of pressure to one or more said fluid. The fluids mentioned in these parts of Quake are used for opening the separating means and are not the separating means themselves. It is

noted that the Examiner has in fact rejected claims 12 and 13 on the grounds that the expandible element is a fluid and may be oil. It is respectfully submitted that this supports the Applicant's argument, that the rejection of claims 8 and 9 are based on a misunderstanding of paragraphs 144 and 147 and that therefore, the subject matter of claims 8 and 9 is also novel over Quake.

Regarding the rejection of claims 12 and 13, these claims depend from claim 1 and are therefore patentable over Quake for the reasons set forth above.

Regarding the rejection of claim 14, this claim depends from claim 1 and is therefore patentable over Quake for the reasons set forth above. Further, Applicant respectfully disagrees with the Examiner's assertion that Quake discloses, in paragraphs 117 and 214, a first holding area comprising a microorganism and a second holding area comprising a fluid reactive with a microorganism. Quake does disclose that microorganisms can be used in the assay device of this prior art document. However, it does not disclose that a second, separate, fluid holding area would hold a fluid capable of reaction with the microorganism. Therefore, the subject matter of claim 14 is also novel over Quake.

Regarding the rejection of claims 15, 16, 18, 19 and 24, these claims depend from claim 1 and are therefore patentable over Quake for the reasons set forth above.

Regarding the rejection of claim 26, this claim depends from claim 1 and is therefore patentable over Quake for the reasons set forth above. Further, it is submitted that Quake does not disclose a cover comprising a dialysis membrane. Indeed, the membrane of Figure 17 (1704) is positioned in between two channels, acting, as described in paragraph 254, as a 'membrane that separates two flow channels'. Membrane 1704 of Quake is not a cover. Therefore, the subject matter of claim 26 is also novel over Quake.

Regarding the rejection of claims 27, 28, 29 and 30 these claims depend from claim 1 and are therefore patentable over Quake for the reasons set forth above.

**Claim Rejections - 35 USC § 103**

**The Examiner has rejected claims 10 and 11 as obvious over the disclosures of Quake in view of Handique and Dove.** Applicant respectfully requests reconsideration of this rejection.

Claim 10 depends from amended claim 1 and claim 11 depends from claim 10. As set forth above, neither Quake nor Handique disclose, teach or suggest the features of amended claim 1. Further, the 'expandable element' to which the Examiner refers in line 14, column 37 of Handique is in fact a plug 76 (corresponding to elements m in Figure 1), whose purpose is to melt and unblock a passage, so that pressure can be released for controlling the movement of a droplet between the hydrophobic areas or 'separating means'. Indeed, the element 76 is described as a 'melting elements to reversibly obstruct, under the control of gas pressure, their respective controlled passages' in lines 17-20 of column 17. The Examiner is also referred to column 14, lines 57-63 for further details. In other words, the plug is not an expandable element as presently recited in claim 1. Instead, it is a meltable element *under the control of* an expandable element, which is a gas in this case.

The Examiner's citation to Dove does not cure the deficiencies of the Quake and Handique patents. Dove is non-analogous art, as it relates to semiconductor switches for use in electrical circuits, while the present invention relates to microfluidic devices. Therefore, it is not proper to combine this reference with Quake and Handique. Notwithstanding, Dove also does not disclose, teach or suggest the biochip recited in claim 1, or any of the claims depending therefrom.

**The Examiner has rejected claim 17 as being obvious over the disclosure of a single document, Quake.** Applicant respectfully requests reconsideration of this rejection. Claim 17 depends from claim 1 and is patentable over Quake when taken alone for the same reasons set forth above regarding claim 1. Further, the reporter constructs of Quake relate to mammalian cells only, which are entirely different in structural and functional features to fungal cells. It is not the case that the person skilled in the art would believe that a reporter construct designed for and used in Quake only for transfection of mammalian cells could be used for bioengineering of fungal cells. Indeed, contrary to the Examiner's assertion, there is absolutely no clear suggestion that the reporter constructs described in paragraphs 333-336 could or should be used for fungal cells, and the person skilled in the art would have no reasonable expectation of success at all. Therefore, the subject matter of claim 17 is also patentable over the disclosure of Quake.

**The Examiner has rejected claims 25 and 31-32 as being obvious over the disclosure of Quake in view of Panovsky.** Applicant respectfully requests reconsideration of this request. These claims depend from claim 1 and are patentable over the disclosure of Quake for the same reasons set forth above regarding claim 1. Panovsky does not cure the deficiencies of the Quake disclosure, as it does not disclose, teach or suggest a biochip wherein pressure is applied to one or more fluids following application of light to an expandible element located adjacent to and upstream of the one or more fluid as recited in claim 1. Instead, Panovsky relates to antibody-controlled microspheres adapted to bind to different types of cells. Figures 4 and 5 to which the Examiner has drawn our attention do not relate to a biochip or a microfluidic device, but to an automated device for analysis of the microspheres. The device is described in the first column of page 11, but not in sufficient detail to say whether these devices are in any way 'similar device' to the claimed biochip and there is no disclosure of using filters as a cover for a biochip as claimed.

It is therefore submitted that the subject matter of dependent claims 25, 31 and 32 is also patentable over the disclosures of Quake and Panovsky, either alone or in combination.

**The Examiner has rejected claims 20-21 as being obvious over the disclosure of Quake in view of Hillman.** Applicant respectfully requests reconsideration of this rejection. These claims depend from claim 1 and are patentable over the disclosure of Quake for the same reasons set forth above regarding claim 1. Hillman does not cure the deficiencies of the Quake disclosure. Hillman is cited only for teaching pre-prepared filters, but Hillman does not disclose, teach or suggest applying pressure to one or more fluids following application of light to an expandible element located adjacent to and upstream of the one or more fluid as recited in claim 1. Therefore, the Examiner's proposed combination does not yield the invention recited in amended claim 1 or any of the claims depending thereon.

Should any issue remain to be resolved regarding the restriction/election requirements, Applicant requests that the Examiner telephone the undersigned attorney of record.

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Respectfully submitted,

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